Pathway-based Monitoring of Biological Effects at Great Lakes sites

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The Great Lakes region suffers from degradation of water and environmental quality due to release of chemicals of emerging concern (CEC) that may threaten near shore health. Critical issues remain in delisting AOC including determining sources of chemicals causing fish health impacts (sediment, sewage overflow, effluent discharges, or tributary waters), relating health impacts to chemical exposure or specific source points, and identifying causes of adverse health effects such as tumors and reproductive effects. Causal information would enable decision makers to identify more appropriate remedial actions thereby facilitating delisting of AOC.

Fish placed in floating cages at different locations within AOC can be used to rapidly monitor the impacts of chemicals on fish health by monitoring chemicals in water, fish, and resulting impacts to fish health in terms of reproductive, physiological and genetic measures. Specific changes found in fish organs such as gonads and liver can be associated with specific effects. For example impacts on egg protein and hormone production related genes are associated with classes of chemicals causing reproductive impacts. Similarly changes in specific genes can be associated with exposure to polyaromatic hydrocarbons and other chemicals.

We are using molecular changes in liver and gonad tissues to identify the health impacts, if any, caused by several high-priority AOC. We will also use gene changes in liver and gonads to identify possible chemicals of concern based on gene changes associated with specific chemical exposures in the laboratory. We expect that this work will identify any potential health effects in fish leading to more accurate assessment of contaminant effects on near shore health. We also expect that this would provide more accurate monitoring of effects during restoration and other efforts in the Great Lakes Restoration Initiative program.

STICs Field	Entry
1 – Influence/profile	Not applicable
2 – Clearance tracking no.	Assigned automatically
3 – Principal Investigator / Project Officer	Gerald Ankley
4- Product title	Copy and paste from abstract
5 - Authors	See abstract
6a- Product type	Presentations and technical summaries
6b-Product subtype	Abstract
6c – Records schedule	Not a senior official
7a – Impact statement	n/a
7b- Product description	Paste in abstract
8 – Bibliographic citation	SETAC North America 33rd Annual Meeting, 11-15 November, Long Beach, CA, USA.
9 - Access	Public
10 – Tracking and Planning Task	2.1.2 2.1.2: AOP-based effects monitoring and exposure reconstruction
10 – Tracking and Planning Product	(2) Case studies evaluating the utility of transcriptomics, metabolomics, and associated bioinformatic methods for comparing the nature and severity of biological impairment as a function of space and/or time to assess the efficacy of remediation efforts within Great Lakes Areas of Concern.
11 – Copyright permission	No
12 - QA	not applicable
13 – Policy implications	No
14 - Keywords	transcriptomics effects-based monitoring Great Lakes Restoration Initiative areas of concern

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